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TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

February 28, 2012

TO: Internal File

THRU: Steve Christensen, Lead SC

FROM: James Owen, Engineer JCO

RE: Construction of Burma Evaporation Basin, Genwal Resources, Inc., Crandall Canyon Mine, C/015/0032, Task #3997

SUMMARY:

On January 12, 2012, the Utah Division of Oil Gas & Mining received an application for an amendment to the Mining & Reclamation Plan (MRP) of the Crandall Canyon Mine. The application seeks approval to construct an evaporation basin which is needed to dispose of the iron sludge from the Crandall mine-water treatment facility.

This memo addresses the application's compliance with the engineering (R645-301-500) and bonding (R645-301-800) sections of the Utah Coal Mining Rules. The following deficiencies were identified:

- **R645-601.542.200** The applicant must provide a reclamation plan, details, maps, etc for backfilling and grading and include a commitment to achieve approximate original contour (AOC) restoration at final reclamation. The applicant may include a reference to the appropriate section of the approved MRP to comply with this requirement. The reference must clearly define the reclamation plan details that will apply to the Burma Basin.

- **R645-601.542.100** The applicant must include a commitment to reclaim the basin according to and along with its approved reclamation timeline, subject to change based on whether or not discharged mine water requires treatment.

- **R645-301-830.140.** The mine has adequate bond in place to allow for construction of the basin. However, the applicant must submit updated bond calculation spreadsheets for demolition, earthwork, revegetation, and bond

calculation summary. These will be incorporated into the bonding section of the mine's MRP and will not need to be included with the Burma Basin attachment. Detailed updates to the appropriate bond calculation spreadsheets will support the unit cost assumptions and calculations made in the application, as well as address discrepancies between the applicant and the Division in terms of total estimated reclamation cost of the basin (the Division's estimation based on the provided unit costs is lower than the applicants).

TECHNICAL ANALYSIS:

OPERATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

The basin will consist of a large, shallow evaporation pond, measuring approximately 100' wide by 200' long. It will be constructed about five feet (60") deep, although only the bottom 36" would be utilized for sludge storage/water retention, leaving the top 24" as freeboard.

It is anticipated that cleanout sludge-water from the Crandall water treatment facility will be hauled to the site about 10 eight-hour days (two working weeks) every two months, at two truckloads per day, and 4000 gallons per truckload. This works out to be about 64,200 cu. ft. per year hauled to the site for disposal. The iron cleanout "sludge" material has typically been analyzed at about 50/0 solids and 95% water by weight, and even less by volume, perhaps 2-3% solids. Therefore, after evaporation of the water, the actual volume of solids left to accumulate in the basin is expected to average about 2400 cu ft. per year. Spread out to dry over the 20,000 square foot bottom of the evaporation basin, the rate of solids accumulation in the basin is expected to be less than 1.5 inches per year or less.

The application states that it is anticipated that the material would not accumulate more than 24" deep in the bottom of the basin during the operational life of the facility, which would take more than 16 years to accumulate to this level. This would then allow the material to be covered with the necessary 48" of backfill at the time of final reclamation.

The application states that the following future scenarios will ultimately unfold:

1) The dried sludge material will be left in place and buried on-site as part of the final reclamation process. The material would be buried under 48" of inert earthen material during reclamation, top-soiled and re-vegetated. The material has been analyzed as is neither toxic, hazardous nor acid-forming, and contains no RCRA metals, as shown by the laboratory result presented in Appendix 10.

2) Excess dried material could be removed from the basin if needed and taken to an approved disposal site, such as ECDC.

3) The basin could be enlarged if needed to accommodate additional future accumulation needs. This could be accomplished by extending the length of the basin either to the east or the west within the existing site. The site could easily accommodate an enlargement of the basin of over three times the currently proposed size. The company acknowledges that any future modification of the facility would require additional SMCRA permitting amendments.

4) There is a possibility that the iron content of the Crandall mine discharge water may naturally drop down to within compliance levels such that future treatment is no longer required, and hence, sludge disposal at the Bunna evaporation facility would no longer be required.

5) There is a possibility that if the iron levels remain high and treatment is required in perpetuity then a more permanent, long-term treatment facility would be constructed, and an alternate sludge disposal system might be incorporated into that facility.

6) The status of the need for treatment at the mine and subsequent disposal at the evaporation basin will be evaluated on an ongoing basis as part of the five-year permit renewal process and the on-going negotiations between the Division and Crandall as a result of Division Order DO-10A.

The iron sludge that is meant to be stored in the basin has been tested in the lab for RCRA metals, and has been found to be non-toxic, non-hazardous and non-acid forming (results included in the application within Attachment 10) Also, the chemicals used in the water treatment (coagulant and flocculent) are all NSF-60 certified (results included in the application within Attachment 12)

The application states that basin will be ringed by an access road which will allow the trucks to dump the sludge at any point around the perimeter of the basin. The perimeter access road will also allow trucks to enter the site, dump their load and exit the site without needing to back up and turn around. As shown in plan view and cross-section view of Drawings 4 and 5 (Attachment 1), the basin will be constructed generally in the following sequence:

1) Prior to any construction-related disturbance at the site, a sediment control structure will be installed around the lower (down-drainage) part of the site. This will consist of a double row of over-lapping excelsior logs staked firmly into the ground. These excelsior logs will provide the primary sediment control during construction, but will be left in place to provide long-term permanent sediment control for the site as well.

2) Perimeter markers will be installed around the boundary of the site to delineate the maximum extent of surface disturbance. Permit signs will also be installed specifying the DOGM permit number and legally-required permittee contact information.

3) The entrance road will then be established into the site. This short (200' long) road segment will exit the Emery County "Burma" Road as per the county-issued encroachment permit (see Attachment 9), and will enter the site along grade from the west side of the property .

4) Included as part of the entrance road construction will be the establishment of an upper drainage ditch. The purpose of this ditch is to permanently divert undisturbed surface drainage around the facility site, both during construction and thereafter throughout the operational life if the facility. It will parallel the entrance road and head east around the top of the site, and discharge into the predominant natural drainage structure located in the eastern part of the site.

5) Grubbing and clearing the area of vegetation, primarily small-growth juniper-pinyon trees, will then commence. The grubbed trees will be stockpiled at the lower end of the site, and will serve as micro-habitat for small animals.

6) The larger surface boulders will then be removed and stockpiled. Many of these boulders are quite large and may require to be broken up using a hoe-ram. These boulders will be relocated to the lower side of the basin and placed in a linear pile which will ultimately become the outs lope of the containment berm of the evaporation basin. Depending on the volume of boulders encountered, excess boulders beyond those that can be incorporated into the berm may be stockpiled separately out of the way at the lower end of the site until final reclamation.

7) Removal of available topsoil material will follow. According to the topsoil survey (see Attachment 6) there is approximately 12" of suitable topsoil material available for salvage, in those areas where topsoil exists. However, due to the preponderance of large boulders occurring on and within the surface material, estimated at about 50% of the surface exposure, the average depth of topsoil material averaged over the entire area can be mathematically approximated at 6". The topsoil will be gathered and placed in a topsoil pile located at the lower end of the site. It is estimated that approximately 1,137 cubic yards of topsoil will be collected, and stored in low-lying linear shaped piles as described in Chapter 2, Topsoil above. It should be noted that much of the boulder salvage and topsoil salvage may be done at the same time due to the natural occurrence of the boulders as part of the pre-existing surface material.

8) After the boulders and topsoil have been salvaged, construction of the evaporation basin will begin. The basin will be constructed using dozers starting at the upper part of the site, and simultaneously excavating the top portion of the basin and filling in the lower portion. Cut and fill will be balanced to provide the finished basin above with the containment berm below. Granular material excavated from the basin will be used to

construct the structural core of the berm. This granular material, forming the upslope section of the containment berm will be compacted to 90% using vibratory equipment and/or wheel rolling. It should be noted that this earthen material in its native condition is a well-suited construction medium, as evidenced by the fact that there are several large-scale commercial gravel operations in the immediate area extracting this same material for local highway projects and other civil engineering projects.

9) The containment berm will be made wide enough (at least 20' wide) to serve as the perimeter access road for the tanker disposal trucks. As noted above, the out slope of the berm will be constructed of the large boulders salvaged from the surface, while the core of the berm (and the upslope section which would be subject to contact with the impounded sludge-water), will be constructed from the smaller-sized gravel material excavated from the basin area, and compacted in-place within the berm. The top of the berm will be capped with a 12" thick layer of gravel which will form an impervious layer over the boulders, and also as a suitable running surface (roadway) for the sludge delivery trucks. The berm out slope boulders will be covered with a 6"-12" layer of subsoil1naterial which will serve as a medium for interim contemporaneous reclamation. A stability analysis for the construction of this earthen berm is included in Attachment 11.

The safety factor for the proposed embankment was calculated at 12.03 for dry conditions and 10.53 for saturated conditions.

10) A continuation of the perimeter access road will be constructed (20' wide) around the upper side of the basin. Rather than being constructed on fill, this upper road will be constructed as a shallow cut in the native ground. In final design, this upper access road will be a continuation of the entrance road.

11). It should be emphasized that this basin is not expected to normally impound much if any water, only temporarily after cleaning disposal. At an average of 80,000 gallons of diluted sludge material per two-month cleaning cycle (as explained above), coming primarily during the concentrated two-week cleaning periods, the maximum depth of standing water at any given time is not anticipated to exceed 5 inches. In between the anticipated two-month cleaning cycles, the evapo-transpiration process is expected to quickly eliminate any standing water to a damp, thin concentrated filter-cake, or dry out completely. The basin will be constructed 5' deep, primarily to provide ample excavated fill material to be replaced to a depth of 48" at the time of final reclamation. With a 5' basin depth, the cleaning water could actually fill to a standing depth of 36" and still allow 24" of freeboard to the top of the containment berm. The basin is not designed to discharge. Therefore, there are no primary or emergency spillways designed into the structure. All natural undisturbed drainage will be routed around the upper end of the basin. Other than the watery material disposed of from Crandall treatment, the only water

entering the basin will be from natural rainfall or snowfall. The average 10-year, 24 hour event in this area is 2.00 inches. Hence, there is no statistical probability that the basin would ever fill with water above the 24" freeboard level to the top of the berm, given the fact that no undisturbed drainage reports to the basin.

12) The in-slopes to the basin will be constructed to a shallow slope of 3 vertical to 1 horizontal. With these gentle in-slopes, and the shallow depth of containment, there will he no necessity for any perimeter barricade or fence for wildlife protection, or public safety. Also, as mentioned previously, the basin contents (dried iron precipitate material) has been tested as nontoxic, non-hazardous and non-acid forming, posing no public health threat.

13) Based on the design shown on Drawings 4 and 5 of Attachment 1, the computer generated volume of excavation is 3,500 cubic yards. Of this volume, 1,137 cubic yards will be removed as topsoil and stockpiled separately. The remaining 2,363 cubic yards of excavation (cut) will be used to construct the berm of the basin.

Findings:

Contents and information provided are sufficient enough to meet the minimum requirements of this section of the Utah Coal Mining Rules.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Analysis:

All required maps, plans, and cross sections of the basin are included within the application in Attachment 1 of Appendix 66. Drawings are appropriately certified.

Findings:

Contents and information provided are sufficient enough to meet the minimum requirements of this section of the Utah Coal Mining Rules.

RECLAMATION PLAN

BACKFILLING, GRADING, and APPROXIMATE ORIGINAL CONTOURS

Regulatory Reference: 30 CFR Sec. 785.15, 817.102, 817.107; R645-301-234, -301-537, -301-552, -301-553, -302-230, -302-231, -302-232, -302-233.

Analysis:

The applicant states that the dried sludge material will be left in place and buried on-site as part of the final reclamation process. The material would be buried under 48" of inert earthen material during reclamation, top-soiled and re-vegetated.

The application does not include details of final reclamation, or commitments that the basin will be backfilled and graded to ultimately achieve approximate original contours (AOC). Also, no timetables are provided.

Cubic yardages for backfilling and grading estimates are included in the application.

Findings:

Contents and information provided are not sufficient enough to meet the minimum requirements of this section of the Utah Coal Mining Rules. The following deficiencies were identified:

- **R645-601.542.200** The applicant must provide a reclamation plan, details, maps, etc for backfilling and grading and include a commitment to achieve approximate original contour (AOC) restoration at final reclamation. The applicant may include a reference to the appropriate section of the approved MRP to comply with this requirement. The reference must clearly define the reclamation plan details that will apply to the Burma Basin.

- **R645-601.542.100** The applicant must include a commitment to reclaim the basin according to and along with its approved reclamation timeline, subject to change based on whether or not discharged mine water requires treatment.

BONDING AND INSURANCE REQUIREMENTS

Regulatory Reference: 30 CFR Sec. 800; R645-301-800, et seq.

Analysis:

Division records indicate that the Crandall mine currently has surety bond posted in the amount of ~ $2,327,000. The mine's estimated reclamation cost estimate in 2015 dollars is $2,278,000. Crandall currently has bond excess in the amount of ~ $49,000.

The applicant states that all unit costs herein presented are taken from the format of the presently (October, 2011) approved Crandall Canyon Mine bonding calculations.

Bonding subtotals included in the application are as follows:

- Demolition $269
- Earthwork $10,006
- Revegetation $5,125
- Sub-total $15,400

The applicant states that indirect costs and escalation costs are presently $1,697,800 / $1,236,798 = 1.3727 or 37.27% of the direct costs. Therefore, the estimated total reclamation bonding cost for the Burma evaporation facility is **$15,400 x 1.3727 = $21,140.**

Findings:

Contents and information provided are not sufficient enough to meet the minimum requirements of this section of the Utah Coal Mining Rules. The following deficiency was identified:

- **R645-301-830.140.** The mine has adequate bond in place to allow for construction of the basin. However, the applicant must submit updated bond calculation spreadsheets for demolition, earthwork, revegetation, and bond calculation summary. These will be incorporated into bonding section of the mine's MRP and will not need to be included with the Burma Basin attachment. Detailed updates to the appropriate bond calculation spreadsheets will support the unit cost assumptions and calculations made in the application, as well as address discrepancies between the total estimated reclamation cost of the basin (my estimation based on the provided unit costs is lower).

RECOMMENDATIONS:

Approval should be denied until deficiencies are addressed.